

2. Remark/Discussion of Issues

Claims

By the present amendment, claim 1 has been revised with respect to a minor informality to which the Examiner objected. Applicants respectfully request entry of the amendment to claim 1, as it does not raise any new issues requiring further search or consideration.

Claims 1-13 are pending in the application, which Applicants respectfully submit are in condition for allowance.

Claim Objections

The Final Office Action objects to claims 1-8 and 10-12 based on the recitation in claim 1, "selecting a physical process of a plurality of physical process" See Final Office Action, p. 2. Without acquiescing to the propriety of the objection, Applicants have amended claim 1 as suggested by the Examiner.

35 U.S.C. § 103 Rejections

Applicants rely at least on the following standards with regard to proper rejections under 35 U.S.C. § 103(a). A *prima facie* case of obviousness has three requirements. First, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, requires some reason that the skilled artisan would modify a reference or to combine references. *Princeton Biochemicals, Inc. v. Beckman Coulter, Inc.*, 411 F.3d 1332 (Fed. Cir. 2005). The Supreme Court has, however, cautioned against the use of "rigid and mandatory formulas" particularly with regards to finding reasons prompting a person of ordinary skill in the art to combine elements in the way the claimed new invention does. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007). Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the same time the invention was made. In other words, a hindsight analysis is not allowed. *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200 (Fed.

Cir. 1991). Lastly, the prior art reference or combination of references must teach or suggest all the limitations of the claims. *In re Wilson*, 424 F.2d 1382 (C.C.P.A. 1970).

Applicants' silence on certain aspects of the rejection is by no means a concession as to their propriety. Rather, because the applied art fails to disclose at least one feature of the claims, for at least the reasons discussed below, Applicants respectfully submit that the rejections are improper and should be withdrawn.

Claims 1-4, 6-8, 10

The Final Office Action rejects claims 1-4, 6-8 and 10 under 35 U.S.C. § 103(a) as being unpatentable over FOX et al. (U.S. Patent No. 5,974,657) in view of PELECKY ("Magnetic Properties of Nanostructured Materials") and PIRAMANAYAGAM et al. ("Role of Thermal Energy on the Magnetic Properties of Laminated Antiferromagnetically Coupled Recording Media"). Applicants respectfully traverse the rejection at least because no proper combination of FOX et al., PELECKY and PIRAMANAYAGAM et al. teaches or suggests all limitations of these claims.

Claim 1

Claim 1 is recites as follows:

*A method of manufacturing a device having a magnetic layer-structure,
the method comprising:*

forming the magnetic layer-structure;

*heating the magnetic layer-structure with an electric current, the
electric current comprising a current pulse having a duration such that no
substantial heat transfer from the magnetic layer-structure to an environment
of the magnetic layer-structure takes place, so that a temperature of the
environment before and after the current pulse is substantially the same; and*

*selecting a physical process of a plurality of physical processes having
corresponding activation energies in the magnetic layer-structure based on the*

current pulse, a duration and an amplitude of the current pulse being adapted to an activation energy of the selected physical process.

As stated in Applicants' previous responses, filed March 20, 2009, and September 4, 2009, respectively addressing previous Office Actions, the Final Office Action does not identify specific steps or elements of FOX et al. that teach or suggest a duration and an amplitude of the current pulse being adapted to an activation energy of a selected physical process. Rather, the Final Office Action summarizes the language of eight claims (*i.e.*, claims 1-4, 6-8, 10) and cites two lengthy sections of FOX et al., without associating specific portions of these sections with the various claim features. *See* Final Office Action, pp. 2-3 (citing FOX et al., col. 3, lines 66-67, col. 4, lines 1-13, and col. 11, lines 7-50).

In addition, in the "Response to Arguments," the Examiner addresses selecting one physical process based on a current pulse, but does not specifically address a duration and an amplitude of the current pulse being adapted to an activation energy of the selected physical process, so it is still unclear what specific steps or elements of FOX et al. that assertedly teach or suggest this feature. The Examiner relies on the new grounds of rejection (*i.e.*, PELECKY and PIRAMANAYAGAM et al.) only to teach selecting a physical process from a plurality of physical processes having corresponding activation energies. *See* Final Office Action, p. 3. Therefore, PELECKY and PIRAMANAYAGAM et al. do not cure this deficiency of FOX et al., or otherwise clearly articulate the supporting grounds for the rejection. Therefore, Applicants respectfully submit that the rejection fails to comply with MPEP § 706, and 37 CFR § 1.104(c)(2), as previously discussed.

Notwithstanding, the portions of FOX et al. PELECKY and PIRAMANAYAGAM et al. cited by the Examiner do not teach or suggest selecting a physical process from multiple physical processes having corresponding activation energies in the magnetic layer-structure based on the current pulse, or a duration and an amplitude of the current pulse being adapted to an activation energy of the selected physical (as discussed above). The Examiner acknowledges that FOX et al. is "silent in selecting a physical process from a plurality of physical processes having corresponding activation energies," and therefore relies on

PELECKY and PIRAMANAYAGAM et al. in combination with FOX et al. to teach the same. *See* Final Office Action, p. 3. However, PELECKY and PIRAMANAYAGAM et al. at most teach multiple physical processes, and are silent as to selecting physical process from among these multiple physical processes based on a current pulse, as recited in claim 1.

PELECKY is directed to physical mechanisms responsible for an energy barrier having fundamental magnetic lengths, which apparently are changed in accordance with changes to the magnitude of the magnetic field, not a current pulse, as recited in claim 1. *See* pp. 1771-1772. PIRAMANAYAGAM et al. is directed to the effects of thermal energy on activation energy, and likewise makes no mention of selecting a physical process from a plurality of physical processes based on current pulse. *See* pp. 3443-3444.

Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness, and that FOX et al. PELECKY, and PIRAMANAYAGAM et al., either alone or in any proper combination, do not teach or suggest all limitations of claim 1. The rejection of claim 1 under 35 U.S.C. § 103(a) should be withdrawn.

Claims 2-4, 6-8 and 10

Claims 2-4, 6-8 and 10 depend, directly or indirectly, from claim 1, and are therefore allowable for at least the reasons discussed with respect to claim 1, as well as in view of their additional recitations. Accordingly, the rejection of claims 2-4, 6-8 and 10 under 35 U.S.C. §103(a) therefore should be withdrawn.

Claims 9 and 13

The Final Office Action rejects claims 9 and 13 under 35 U.S.C. § 103(a) as being unpatentable over FOX et al. (U.S. Patent No. 5,974,657) in view of LENSSEN et al. (W00/79298). Applicants respectfully traverse the rejection at least because no proper combination of FOX et al. and LENSSEN et al. teaches or suggests all limitations of these claims.

Claim 9

Claim 9 recites as follows:

A method of manufacturing a magnetoresistive sensor device having a magnetic layer-structure, the method comprising:

forming the magnetic layer-structure; and

heating the magnetic layer-structure with an electric current, the electric current comprising a current pulse having a duration that prevents substantial heat transfer from the magnetic layer-structure to an environment of the magnetic layer-structure, so that a temperature of the environment before and after the current pulse is substantially the same,

wherein the magnetic layer-structure comprises a first bias layer having a first antiferromagnetic material with a first blocking temperature and a second bias layer having a second antiferromagnetic material with a second blocking temperature different from the first blocking temperature, a magnetization direction of the first or second antiferromagnetic material having the higher blocking temperature being set before a magnetization direction of the first or second antiferromagnetic material having the lower blocking temperature is set.

The Final Office Action asserts only that LENSSEN et al. “teaches current change as changing physical processes.” See Final Office Action, p. 5 (citing page 3, lines 19-23). Initially, Applicants note that claim 9 does not recite current changes as changing physical processes. Rather, claim 9 recites an electric current, which includes a current pulse having a duration that prevents substantial heat transfer from the magnetic layer-structure to an environment of the magnetic layer-structure. Although Applicants have previously raised this issue, the Examiner has not addressed the significance (or lack of significance) with respect to claim 9 of LENSSEN et al. assertedly teaching “current change as changing physical processes” in the “Response to Arguments.” See Final Office Action, p. 7.

Further, the cited portion of LENSSEN et al. describes “induc[ing] a magnetic field that ‘sets’ the exchange-biasing direction of the device in opposite directions, while the devices are heated above the blocking temperature of the exchange-biasing material R.” *Id.* However, this description does not teach or suggest a first bias layer having a first antiferromagnetic material with a first blocking temperature and a second bias layer having a second antiferromagnetic material with a second blocking temperature different from the first blocking temperature, as recited in claim 9. To the contrary, it would appear that LENSSEN et al. refers to “devices” including the same “exchange-biasing material R” being heated above the same “blocking temperature,” as opposed to different bias layers having different antiferromagnetic materials with different blocking temperatures, respectively.

In response to this argument, the Final Office Action asserts for the first time that FOX et al. (not LENSSEN et al.) provides different biasing layers. *See* Final Office Action, pp. 4-5, 7 (citing col. 12, lines 49-51, of FOX et al.) Initially, Applicants note that this constitutes new grounds of rejection since the Examiner now relies on a different reference (FOX et al.) and a portion of that reference (col. 12, lines 49-51) not previously cited, and thus finality of the rejection is improper. Further, Applicants note that col. 12, lines 49-51, of FOX et al., discuss FIGs. 34-37, which show “biasing layers for two different types of spin valve heads,” not two biasing layers in one magneto-resistive sensor device, and certainly not two biasing layers having respective antiferromagnetic materials with different blocking temperatures, as recited in claim 9. LENSSEN et al. does not overcome these deficiencies, as discussed above.

Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness, and that FOX et al. PELECKY, and PIRAMANAYAGAM et al., either alone or in any proper combination, do not teach or suggest all limitations of claim 9. The rejection of claim 9 under 35 U.S.C. § 103(a) therefore should be withdrawn.

Claim 13

Claim 13 recites as follows:

A method of manufacturing a magnetoresistive bridge device of a magnetic system comprising a plurality of magnetoresistive bridge devices, the method comprising:

forming a magnetic layer-structure; and

heating the magnetic layer-structure with an electric current, the electric current comprising a current pulse having a duration that prevents substantial heat transfer from the magnetic layer-structure to an environment of the magnetic layer-structure, so that a temperature of the environment before and after the current pulse is substantially the same,

wherein the current pulse is applied for offset compensation by irreversibly changing a resistance of at least one of the magnetoresistive bridge devices through local heating.

The Final Office Action asserts only that LENSSEN et al. “teaches current change as changing physical processes.” See Final Office Action, p. 5 (citing page 3, lines 19-23). Initially, Applicants note that claim 13 does not recite current changes as changing physical processes. Rather, claim 13 recites an electric current, which includes a current pulse having a duration that prevents substantial heat transfer from the magnetic layer-structure to an environment of the magnetic layer-structure. Although Applicants have previously raised this issue, the Examiner has not addressed the significance (or lack of significance) with respect to claim 13 of LENSSEN et al. assertedly teaching “current change as changing physical processes” in the “Response to Arguments.” See Final Office Action, p. 7.

Further, the cited portion of LENSSEN et al. describes “induc[ing] a magnetic field that ‘sets’ the exchange-biasing direction of the device in opposite directions, while the devices are heated above the blocking temperature of the exchange-biasing material R.” *Id.* However, this description does not teach or suggest a current pulse being applied for offset compensation by irreversibly changing a resistance of at least one of the magnetoresistive bridge devices through local heating, as recited in claim 13.

In response to this argument, the Final Office Action asserts for the first time that FOX et al. (not LENSSEN et al.) teaches application of current for changing a resistance of a magnetoresistive device. *See* Final Office Action, pp. 4-5, 7 (citing col. 7, lines 5-10, of FOX et al. Initially, Applicants note that this constitutes new grounds of rejection since the Examiner now relies on a different reference (FOX et al.) and a portion of that reference (col. 7, lines 5-10) not previously cited, and thus finality of the rejection is improper. Further, Applicants note that col. 7, lines 5-10, of FOX et al., provide that resistance changes in response to external magnetic fields, not current pulse, as recited in claim 13. Rather, according to FOX et al., the “sense current I_s conducted through the sensor causes these resistance changes to be manifested as potential changes.” *See* FOX et al., col. 7, lines 7-9.

LENSSSEN et al. does not overcome this deficiency, as evidently acknowledged by the Examiner, since LENSSEN et al. is relied upon only to teach “irreversible” changes to resistance. *See* Final Office Acton, p. 7 (citing Abstract; p. 2, lines 17-20). However, LENSSEN et al. does not teach or suggest this feature, as well. The Abstract addresses irreversible magnetization directions, not resistances. Also, p. 2, lines 17-20, does not mention irreversibly changing resistance in response to current pulse.

Accordingly, Applicants respectfully submit that the Examiner has not established a *prima facie* case of obviousness, and that FOX et al. PELECKY, and PIRAMANAYAGAM et al., either alone or in any proper combination, do not teach or suggest all limitations of claim 13. The rejection of claim 13 under 35 U.S.C. § 103(a) therefore should be withdrawn.

Claim 5

The Final Office Action rejects claim 5 under 35 U.S.C. § 103(a) as being unpatentable over FOX et al. in view of VOEGELI et al. (U.S. Patent No. 5,974,757). *See* Final Office Action, p. 5. Applicants respectfully traverse the rejection because no proper combination of FOX et al. and VOEGELI et al. teaches or suggests every element of claim 5.

Claim 5 depends from claim 1, and is therefore allowable for at least the reasons discussed above with respect to claim 1, as well as in view of its additional recitations. In addition, because of its dependency from claim 1, claim 5 incorporates all of the features of

claim 1, including "selecting a physical process from a plurality of physical processes having corresponding activation energies," which the Examiner acknowledges FOX et al. does not disclose. See Final Office Action, p. 3. Yet, with respect to the rejection of claim 5, the Examiner does not provide any reference allegedly teaching or suggesting these features.

The Examiner relies on VOEGELI et al. only to disclose a sequence of current pulses. See Final Office Action, p. 5. Therefore, VOEGELI et al. does not cure the deficiencies of FOX et al. discussed above. Accordingly, the rejection of claim 5 under 35 U.S.C. § 103(a) should be withdrawn.

Claims 11 and 12

The Final Office Action rejects claims 11 and 12 under 35 U.S.C. § 103(a) as being unpatentable over FOX et al. in view of KUIPER et al. (WO 00/79298). See Final Office Action, p. 6. Applicants respectfully traverse the rejection because no proper combination of FOX et al. and KUIPER et al. teaches or suggests every element of claims 11 and 12.

Claims 11 and 12 depend indirectly from claim 1, and are therefore allowable for at least the reasons discussed with respect to claim 1, as well as in view of their additional recitations. In addition, because of their dependency from claim 1, claims 11 and 12 incorporate all of the features of claim 1, including "selecting a physical process from a plurality of physical processes having corresponding activation energies," which the Examiner acknowledges FOX et al. does not disclose. See Final Office Action, p. 3. Yet, with respect to the rejection of claims 11 and 12, the Examiner does not provide any reference allegedly teaching or suggesting these features.

The Examiner relies on KUIPER et al. only to disclose multiple devices including a Wheatstone bridge configuration. See Final Office Action, p. 6. Therefore, KUIPER et al. does not cure the deficiencies of FOX et al., discussed above. Accordingly, the rejection of claims 11 and 12 under 35 U.S.C. § 103(a) should be withdrawn.

CONCLUSION

In view of the foregoing explanations, Applicants respectfully request that the

Appl. No. 10/559,915
Amendment and/or Response
In Reply to Final Office Action December 9, 2009

Response under 37 C.F.R. § 1.116

Examiner reconsider and reexamine the present application, allow claims 1-13 and pass the application to issue. In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact Van C. Ernest (Reg. No. 44,099) at (571) 283-0720 to discuss these matters.

Respectfully submitted on behalf of:
Philips Electronics North America Corp.

A handwritten signature in black ink, appearing to read 'V-C Ernest', is written over a horizontal line.

by: Van C. Ernest (Reg. No. 44,099)

Date: February 4, 2010

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